| **Accelerated 8th Grade Math - Sequencing the Common Core Standards** | | | | | |
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| **Units** | **1** | **2** | **3** | **4** | **5** |
| **Relationships Between Quantities and Reasoning with Equations** | **Linear and Exponential Relationships** | **Descriptive Statistics** | **Expressions and Equations** | **Quadratics Functions and Modeling** |
| **Standards** | N Q 1  N Q 2  N Q 3  A SSE 1  A CED 1  A CED 2  A CED 3  A CED 4  A REI 1  A REI 3 | N RN 1  N RN 2  8 EE 8  A REI 5  A REI 6  A REI 10  A REI 11  A REI 12  8 F 1  8 F 2  8 F 3  F IF 1  F IF 2  F IF 3  8 F 4  8 F 5  F IF 4  F IF 5  F IF 6  F IF 7  F IF 9  F BF 1  F BF 2  F BF 3  F LE 1  F LE 2  F LE 3  F LE 5 | S ID 1  S ID 2  S ID 3  8 SP 1  8 SP 2  8 SP 3  8 SP 4  S ID 5  S ID 6  S ID 7  S ID 8  S ID 9 | A SSE 1  A SSE 2  A SSE 3  A APR 1  A CED 1  A CED 2  A CED 4  A REI 4  A REI7 | N RN 3  8 G 6  8 G 7  8 G 8  F IF 4  F IF 5  F IF 6  F IF 7  F IF 8  F IF 9  F BF 1  F BF 3  F BF 4  F LE 3 |
| **Vocabulary** | Term, factor, expression, coefficient, equation, variable, function, inequality, constant term, input, output, function notation | Linear association, linear equation, linear relationship, linear function, linear inequality, linear model, quadratic relationship, quadratic function, quadratic model, quadratic association, domain, range, slope, rate of change, rational equation, rational function, nonlinear, exponent, radical expression, properties of exponents, máxima and minima, zeros of a function, system of equations, system of inequalities, intercepts, symmetry | Scatterplot, dot plot, histogram, box plots, correlation, correlation coefficient, causation, measures of central tendency, outliers, extreme values, positive/negative correlation, positive/negative association, line of best fit, bivariate, univariate, frequencies, two-way table, linear, exponential | Completing the square, constraints, factoring, factorization, factor a polynomial, polynomial function, polynomial, binomial, closed system, coordinate axes, coordinate plane, quadratic formula, origin, scale | Piecewise function, maxima/minima, average rate of change, restricted domain, extraneous solutions, equal intervals, Pythagorean Theorem, rational and irrational numbers, degree of polynomial, exponential decay, exponential function, exponential growth, exponential model, increasing exponentially, inverse function, square root function? Absolute value function? |
| **Supporting Materials** | Related problems throughout the text  1.3 Chp. Sec.  3.8  3.1-3.4  6.1-6.4  1.6  4.2  4.3  4.5-4.7  5.1-5.4  1.5  2.4  2.5  3.3  5.1  6.7  7.2-7.4  7.6  3.6-3.7 | p. 509  Chp. Sec  7.1-7.5  Chp 4, Lesson 2  4.2  10.3  Ext. p. 251  6.7  7.6  (Course 3)  2.7  3.1-3.5  6.1-6.3  **Algebra 1:** 3.4  PFC and Navigations materials and 11.1  **Algebra 1:** 10.8  1.6  1.7  Pg. 49  Chp 2, pg 71  4.7  Chp 5, pg. 309  Chp 8, pg. 539  **Course 3:** 11.2  **Course 3:** 11.5  4.3  4.4  5.7  10.1  Pg 641  1.7  5.4  5.2  Pg. 300  5.3  5.6  Pg. 222, 4.2, 4.3, 4.5  Pg. 251, 4.6, 6.5  10.2, pg. 641  10.3 pg. 650  Pg 669  Pg 396  8.5  8.6  5.1-5.2  Pg. 300  5.4  Pg. 309  Pg. 539  Pg. 290  8.5-8.6  Pg. 669  10.8 |  | 1.3  3.8  2.4, 2.6  9.1-9.3  9.8  Pg. 582  9.5-9.7  Pg. 641  10.3  10.5  8.5-8.6  9.1-9.3  Pg. 561  3.1-3.4  6.1-6.4  1.6  4.2  4.3  4.5-4.7  5.1-5.4  Pg. 727  9.4-9.8  10.4-10.7 | 9.3-9.4  4.3  4.4  5.7  8.5  8.6  10.1-10.3  Pg. 641  1.7  4.2  5.4  10.1  5.2  5.3  5.6  Pg 300  4.5  4.6  Pg. 222  Pg. 251  Pg. 650  Pg. 669  5.3  6.5  11.1  Pg. 396  Pg. 717  10.5  Pg. 396  5.1-5.4  5.6  10.8  4.7  Pg. 290  10.1-10.2 |
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**ACCELERRATED 8th GRADE**

**8 Mathematical Practices**

* Make sense of problems and persevere in solving them
* Reason abstractly and quantitatively.
* Construct viable arguments and critique the reasoning of others.
* Model with mathematics.
* Use appropriate tools strategically.
* Attend to precision.
* Look for and make use of structure.
* Look for and express regularity in repeated reasoning.

| **Unit** | **Clusters** | **Standards** | **Material Alignment** | **Additional** |
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| **Unit 1**  **Relationships**  **Between Quantities**  **and Reasoning with**  **Equations** | Reason quantitatively and use units to solve problems.  (*Working with quantities and the*  *relationships between them provides*  *grounding for work with expressions,*  *equations, and functions.*12) | ﻿**N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.  **N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.    **N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | Related problems throughout the text  Needs to be built  Does not exist | Illustrative Mathematics   * Ice Cream Van * Traffic Jam   NCTM   * Fuel for Thought   Achieve.org   * Access Ramp |
|  | Interpret the structure of expressions.  (*Limit to linear expressions and to*  *exponential expressions with integer*  *exponents.)* | ﻿**A.SSE.1** Interpret expressions that represent a quantity in terms of its context.★   1. Interpret parts of an expression, such as terms, factors, and coefficients. 2. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret (1+r)n as the product of P and a factor not depending on P. | 1.3 Chp. Sec.  3.8 | Illustrative Mathematics   * Delivery Trucks   MAP   * Designing Candy Cartons |
|  | Create equations that describe numbers or relationships  (*Limit A.CED.1 and A.CED.2 to linear*  *and exponential equations, and, in the*  *case of exponential equations, limit*  *to situations requiring evaluation of*  *exponential functions at integer inputs.*  *Limit A.CED.3 to linear equations and*  *inequalities. Limit A.CED.4 to formulas*  *which are linear in the variables of*  *interest.)* | ﻿**A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.  **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.  **A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.    **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V = IR to highlight resistance R. | 3.1-3.4  6.1-6.4  1.6, 4.2, 4.3  4.5-4.7, 5.1-5.4  1.5, 1.6, 2.4, 2.5  3.3, 5.1, 6.1-6.4, 6.7  7.2-7.4, 7.6  3.8 | Illustrative Mathematics   * Buying A Car * Basketball * Dimes and Quarters |
|  | Understand solving equations as a process of reasoning and explain the reasoning.  *(Students should focus on and master*  *A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future units and courses. Students will solve exponential equations in Algebra II.)* | **A.REI.**1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method | 3.1-3.4  3.6-3.7 | Illustrative Mathematics   * Two Squares are Equal * Same Solutions? |
|  | Solve equations and inequalities in one variable.  *(Extend earlier work with solving linear*  *equations to solving linear inequalities*  *in one variable and to solving literal*  *equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as 5x = 125 or 2x = 1/16 .)* | **A.REI.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | 3.1-3.4  3.6-3.7  6.1-6.3 | Achieve   * Ivy Smith Grows Up |
| **Unit 2**  **Linear and Exponential**  **Relationships** | • Extend the properties of exponents to rational exponents.  *(In implementing the standards in*  *curriculum, these standards should*  *occur before discussing exponential*  *models with continuous domains.)* | **N.RN.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.  **N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. | Pg. 509  Pg. 509 | Illustrative Mathematics   * Extending Definitions of Exponents Variation 2   MAP   * Rational and Irrational Numbers 1 |
|  | •Analyze and solve linear equations and pairs of simultaneous linear equations.  (While this content is likely subsumed  by A.REI.3, 5, and 6, it could be used  for scaffolding instruction to the more sophisticated content found there.) | ﻿**8.EE.8** Analyze and solve pairs of simultaneous linear equations.  **a.** Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.  **b.** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.  **c.** Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. | Chp. Sec.  7.1-7.5 | Illustrative Mathematics   * Quinoa Pasta 1   MAP   * Building and Solving Equations 1 |
|  | Solve systems of equations.  (*Include cases where two equations*  *describe the same line (yielding*  *infinitely many solutions) and cases*  *where two equations describe parallel*  *lines (yielding no solution).* | **A.REI.5** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.  **A.REI.6** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. | Nothing  7.1-7.5 | There are several classroom tasks aligned to these Standards in the online document called  *Secondary One Mathematics:*  *An Integrated Approach*  *Module1*  *Systems of Equations*  *and*  *Inequalities*  *By*  *The Mathematics Vision Project* |
|  | Represent and solve equations and inequalities graphically  *(For A.REI.10 focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future* *courses.*  *For A.REI.11, focus on* *cases where f(x) and g(x) are linear or exponential.)* | **A.REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).  **A.REI.11** Explain why the *x*-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of  the equation *f(x) = g(x)*; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★  **A.REI.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. | Chp 4, Lesson 2  4.2  10.3  Ext. pg. 251  6.7, 7.6  (Course 3) |  |
|  | Define, evaluate, and compare functions.  *(While this content is likely subsumed*  *by F.IF.1-3 and F.IF.7a, it could be used*  *for scaffolding instruction to the more*  *sophisticated content found there.)* | **8.F.1** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.  **8.F.2** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.  **8.F.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. | 2.7, 3.1-3.5  6.1-6.3  Algebra 1: 3.4, PFC and Navigations materials and 11.19.2012  Algebra 1: 10.8 | DMI class Patterns, Functions, and Change  Illustrative Mathematics   * Function Rules * Model with Linear Functions * Foxes and Rabbits |
|  | Understand the concept of a function and use function notation.  *(Students should experience a variety of types of situations modeled by functions Detailed analysis of any particular class of function at this stage is not advised. Students should*  *apply these concepts throughout their future mathematics courses.*  *Constrain examples to* *linear functions and exponential functions having integral domains. In F.IF.3, draw connection to F.BF.2, which requires*  *students to write arithmetic and geometric sequences.)* | **F.IF.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain  exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of *f* is the graph of the equation y = f(x).  **F.IF.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of context.  **F.IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the  Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1. | 1.6, 1.7  Pg. 49 and 4.7  Chp 2, pg. 71 and 4.7  Chp 5, pg. 309  Chp 8, pg. 539 | Illustrative Mathematics   * Identifying Graphs of Functions * Cell Phones * Average Cost |
|  | Use functions to model relationships between quantities.  *(While this content is likely subsumed by F.IF.4 and F.BF.1a, it could be used*  *for scaffolding instruction to the more sophisticated content found there.)* | **8.F.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.  **8.F.5** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. | Course 3: 11.2  Course 3: 11.5 | Illustrative Mathematics   * How Is the Weather? * Baseball Cards * Video Streaming * Battery Charging |
|  | Interpret functions that arise in applications in terms of a context.  *(For F.IF.4 and 5, focus on linear and exponential functions. For F.IF.6, focus*  *on linear functions and exponential functions whose domain is a subset of*  *the integers. Unit 5 in this course and Algebra II course address other types of functions.)* | **F.IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities,  and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where  the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★  **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★  **F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★ | 4.3, 4.4  5.7, 8.5, 8.6  10.1, 10.2, 10.3  Pg. 641  1.7, 4.2, 4.3  5.4, 8.5, 10.1  4.4, 5.2  Pg. 300, 5.3, 5.6 | CCSS Toolbox.org   * Isabella’s Credit Card   Illustrative Mathematics   * The High School Gym * The Canoe Trip |
|  | Analyze functions using different representations.  *(For F.IF.7a, 7e, and 9 focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example,*  *compare the growth of two linear functions, or two exponential functions such as y=3n and y=100·2n.)* | **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more  complicated cases.★   1. Graph linear and quadratic functions and show intercepts, maxima, and minima.   **e.** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.  **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. | Pg. 222, 4.2, 4.3, 4.5  Pg. 251, 4.6, 6.5  5.3, 10.1  10.2, pg. 641  10.3, pg. 650  Pg. 669  Pg. 396, 8.5, 8.6  10.1 | Davis School District web site examples at:  www.davis.k12.ut.us/Page/49040 |
|  | Build a function that models a relationship between two quantities.  *(Limit F.BF.1a, 1b, and 2 to linear and exponential functions. In F.BF.2, connect arithmetic sequences to linear functions and geometric sequences to exponential functions in F.BF.2.)* | **F.BF.1** Write a function that describes a relationship between two  quantities.★   1. Determine an explicit expression, a recursive process, or steps for calculation from a context. 2. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.   **F.BF.2** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★ | 5.1-5.2  Pg. 300, 5.3, 5.4  5.6, 5.7, 8.5, 8.6  Pg. 309  Pg. 539 | Illustrative Mathematics   * Temperature Conversions * The Canoe Trip * Compounding with 5% Interest Rate |
|  | Build new functions from existing functions.  *(Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard.)* | **F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. | 4.7, pg. 290, pg. 396  8.5-8.6, 10.1-10.2  Pg. 669 | CCSS Toolbox.org   * Cellular Growth * Golf Balls * Rabbit |
|  | Construct and compare linear, quadratic, and exponential models and solve problems.  *(For F.LE.3, limit to comparisons between linear and exponential models.)* | **F.LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.  **a.** Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals.  **b.** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.  **c.** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.  **F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).  **F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. | 10.8  4.4  8.5, 8.6  1.7, 5.1-5.4  5.6-5.7  Chp 8.5-8.6  10.8 | CCSS Toolbox.org   * Cellular Growth * Golf Balls * Rabbit   Illustrative Mathematics   * Illegal Fish * Exponential vs Linear Growth 1   NCTM Navigations Through Discrete Mathematics Gr. 6-12 book |
|  | Interpret expressions for functions in terms of the situation they model.  *(Limit exponential functions to those of the form f(x) = bx + k )* | **F.LE.5** Interpret the parameters in a linear or exponential function in terms of a context | 5.1-5.3  5.6, 8.5-8.6 | Illustrative Mathematics   * Illegal Fish |
| **Unit 3**  **Descriptive Statistics** | Summarize, represent, and interpret data on a single count or measurement variable.  *(In grades 6 – 7, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the*  *characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.)* | **S.ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).  **S.ID.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  **S.ID.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). |  | Illustrative Mathematics   * Speed Tra[   MARS   * Archery * Suzi’s Company |
|  | Investigate patterns of association in bivariate  *(While this content is likely subsumed by S.ID.6-9, it could be used for scaffolding instruction to the more sophisticated content found there.)* | **8.SP.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.  Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.  **8.SP.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.  **8.SP.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.  **8.SP.4** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores? | Build | Illustrative Mathematics   * Texting and Grades * Birds’ Eggs * Battery Charging * Music & Sports   DMI activities from Patterns, Functions, and Change  NCTM Navigating Through Data book   * Olympic * Predicting * Pizza * Reading Scatterplots * Stopping Distances * Batteries   OPI – IEFA   * Reservation Land Area * Montana Native American Population * Ko’ko’hasenestotse |
|  | Summarize, represent, and interpret data on two categorical and quantitative variables.  *(Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.)* | **S.ID.6b** should be focused on linear models, but may be used to preface quadratic functions in the Unit 6 of this course.  **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.  **S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  **a.** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or chooses a function suggested by the context. Emphasize linear and exponential models.  **b.** Informally assess the fit of a function by plotting and analyzing residuals.  **c.** Fit a linear function for a scatter plot that suggests a linear association. |  | MAP   * A Case of Muddying the Waters   MARS   * Population * Snakes |
|  | Interpret linear models.  *(Build on students’ work with linear relationship and; introduce the correlation coefficient. The focus here is on the computation and*  *interpretation of the correlation coefficient as a measure how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.)* | **S.ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.  **S.ID.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.  **S.ID.9** Distinguish between correlation and causation. |  | Illustrative Mathematics   * Coffee & Crime |
| **Unit 4**  **Expressions and**  **Equations** | Interpret the structure of expressions.  *(Focus on quadratic and exponential expressions. For A.SSE.1b, exponents*  *are extended from integer found in Unit 1 to rational exponents focusing*  *on those that represent square roots and cube roots.)* | **A.SSE.1** Interpret expressions that represent a quantity in terms of its context.★  **a.** Interpret parts of an expression, such as terms, factors, and coefficients.  **b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.  **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). | 1.3  3.8  2.4, 2.6  9.1-9.3, 9.8  Pg. 582 | Illustrative Mathematics   * Course of Antibiotics * Animal Population |
|  | Write expressions in equivalent forms to solve problems    *(Consider extending this unit to include the relationship between properties of logarithms and properties of exponents.)* | **A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★  **a.** Factor a quadratic expression to reveal the zeros of the function it defines.  **b.** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.  **c.** Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. | 9.5-9.7 pg. 641  10.3  10.5  8.5-8.6 | MARS   * Quadratic * Two Solutions   Problem of the Month   * Miles of Tiles |
|  | Perform arithmetic operations on polynomials.  *(Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x.)* | **A.APR.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition,  subtraction, and multiplication; add, subtract, and multiply polynomials. | 9.1-9.3  Pg. 561 |  |
|  | Create equations that describe numbers or relationships.  *(Extend work on linear and exponential equations in Unit 1 to include quadratic equations. Extend A.CED.4 to formulas involving squared variables. Extend work on linear and exponential equations in Unit 1 to include Quadratic equations. Extend A.CED.4 to formulas involving squared variables.)* | **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.  **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.  **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V = IR to highlight resistance e R. | 3.1-3.4  6.1-6.4  1.6, 4.2, 4.3  4.5-4.7, 5.1-5.4  3.8 | NCTM   * Over the Hill |
|  | Solve equations and inequalities in one variable.  *(Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.)* | **A.REI.4** Solve quadratic equations in one variable.  **a.** Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form.  **b.** Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. | 10.5, pg. 727  9.4-9.8  10.4-10.7 |  |
|  | Solve systems of equations.  *(Include systems consisting of one linear and one quadratic equation.*  *Include systems that lead to work with fractions. For example, finding the intersections between x2+y2=1 and y = (x+1)/2 leads to the point (3/5, 4/5) on the unit circle, corresponding to the Pythagorean triple 32 + 42 = 52.)* | **A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x2 + y2 = 3. |  | Illustrative Mathematics   * Linear and Quadratic Systems |
| **Unit 5**  **Quadratics Functions**  **and Modeling** | Use properties of rational and irrational numbers.  *(Connect N.RN.3 to physical situations,*  *e.g., finding the perimeter of a square of area 2.)* | **N.RN.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is  irrational; and that the product of a nonzero rational number and an irrational number is irrational. |  | Illustrative Mathematics   * Rational or Irrational? |
|  | Understand and apply the Pythagorean theorem.  *(Discuss applications of the Pythagorean theorem and its connections to radicals, rational exponents, and irrational numbers.)* | **8.G.6** Explain a proof of the Pythagorean theorem and its converse.  **8.G.7** Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.  **8.G.8** Apply the Pythagorean theorem to find the distance between two points in a coordinate system. | 9.3-9.4  9.3, 9.4  Need to create | OPI – IEFA   * Tipi Geometry and Trigonometry   Illustrative Mathematics   * Converse of the Pythag. Theorem   NCTM   * American Indian Housing |
|  | Interpret functions that arise in applications in terms of a context.  *(Focus on quadratic functions; compare with linear and exponential functions studied in Unit 2.)* | **F.IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities,  and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where  the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★  **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★  **F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★ | 4.3, 4.4  5.7, 8.5, 8.6  10.1-10.3  Pg. 641  1.7, 4.2, 4.3  5.4, 8.5, 10.1  4.4, 5.2, 5.3  5.6, pg. 300 | MARS   * Printing Tickets * Graphs (2004) * Graphs (2007) * Sorting Functions |
|  | Analyze functions using different representations.  *(For F.IF.7b, compare and contrast absolute value, step and piecewise-defined functions with linear, quadratic, and exponential functions. highlight issues of domain, range, and usefulness when examining piecewise-defined functions. Note that this unit, and in particular in F.IF.8b, extends the work begun in Unit 2 on exponential functions with integral exponents. For F.IF.9, focus on expanding the types of functions considered to include, linear, exponential, and quadratic. Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be* *factored.)* | **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★   1. Graph linear and quadratic functions and show intercepts, maxima, and minima.   **b.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  **F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  **a.** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.  **b.** Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.  **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. | 4.2, 4.3, 4.5, 4.6  Pg. 222, pg. 251  Pg. 641, pg. 650, pg. 669  5.3, 10.1-10.3  6.5, 11.1, pg. 396  Pg. 717  10.5  8.5, 8.6  Pg. 396  8.5, 8.6  10.1 | MARS   * Functions   Problem of the Month   * Digging Dinosaurs |
|  | Build a function that models a relationship between two quantities.  *(Focus on situations that exhibit a*  *quadratic relationship.)* | **F.BF.1** Write a function that describes a relationship between two quantities.★  **a.** Determine an explicit expression, a recursive process, or steps for calculation from a context.  **b.** Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. | 5.1-5.4  Pg. 300  5.6, 5.7, 8.5, 8.6  10.8 | MARS   * Coffee * Conference Tables * How Old Are They? |
|  | Build new functions from existing functions.  *(For F.BF.3, focus on quadratic functions, and consider including absolute value functions. For F.BF.4a, focus on linear functions but consider*  *simple situations where the domain of the function must be restricted in order for the inverse to exist, such as*  *f(x) = x2, x>0)* | **F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.  **F.BF.4** Find inverse functions.  **a.** Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 for x > 0 or f(x) = (x+1)/(x-1) for x ≠ 1. | 4.7, pg. 290, pg. 396  8.5-8.6  10.1-10.2 pg. 669 |  |
|  | Construct and compare linear, quadratic and exponential models and solve problems.  *(Compare linear and exponential growth to growth of quadratic growth.)* | **F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. | 10.8 | MARS   * Functions   NCTM Illuminations web site   * One Grain of Rice |